

REMARKS/ARGUMENTS

Claims 1, 2, 6-10, and 12-20 remain in this application. Claims 3-5 and 11 have been cancelled. Claims 3 – 5, 11, and 21 – 37 were previously cancelled.

1. Drawings

The Examiner previously indicated on the October 28, 2003 form PTOL-326 that the formal drawings previously submitted had been approved.

2. § 103 Rejections

The Examiner has rejected claims 1, 8, 9/1, 9/8, 12, and 13 under 35 U.S.C. § 103(a) as being unpatentable for over Danner (1,674,856) in view of Anderson (6,196,026).

The Examiner stands by his previous assertion that Danner teaches a method of producing sheets of glass wherein;

1. The sheet of glass has two faces, face (F1) and face (F2) **wherein one side of said sheet (F1) presents a “hardened skin surface which will prevent it becoming marred”**. (Emphasis added)
2. A stream of glass (1a) delivered which has a first face (s2) and a second face (s1), and each face is free from making contact with any surface as evidenced in the region of the s1 and s2 lead lines.
3. The first face (s2) is placed into contact with a treatment device (4a) while maintaining at least a central strip of the second face (s1) free from any contact with any surface..... Further, while the glass is in contact with the “treatment device or mechanism (4a)” the second face (s1) of the glass sheet (1a) is cooled by an air blast nozzle. Since the inverse relationship between glass temperature and viscosity is well established and the “treatment device or mechanism (4a)” cooperates in the cooling of the glass sheet”, said device increases the viscosity of the glass sheet. The “treatment device or mechanism (4a)” is therefore understood to both accompany “the falling of said glass while increasing glass viscosity” as claimed.

4. A device or mechanism for controlling glass travel speed, width, and thickness acts upon the treated stream (1a') (pg 3, Lines 7-8).
(Emphasis added).

The present invention is directed at a fusion draw method for low viscosity glasses. In a fusion draw process, the stream of fused melted glass falls down through the air without making contact with any surface, in order to form glass sheets having a high surface quality (e.g. highly smooth) that is not achievable via other processes without subsequent polishing steps. As the glass stream/sheet falls through the air and cools, but is still workable, it is acted upon to further control its speed, width and thickness. The glass sheet is typically further drawn, while still workable, in order to further thin and/or widen the stream glass before it hardens into a sheet of glass. When attempting to fusion draw glass sheets having a low viscosity, the unsupported falling low viscosity molten glass sheet tends to become unstable and may fall apart when being drawn, or even under its own weight, prior to hardening. The resulting drools or wavy sheets of glass are unusable.

The present invention solves this problem by temporarily supporting the low viscosity stream of glass, in order to raise its viscosity to the point that it can support its own weight, but is still soft and workable. The stream of glass is then delivered to further treatment devices, while still soft and workable, for further widening and/or and thinning of the glass sheet to the desired dimensions that are not achievable without such further treatment.

The only remaining independent Claim, claim 1 as previously amended, claims:

“A method of producing sheets of glass having two faces (F1, F2) with at least one of said faces (F1) presenting a high surface quality in a fusion down draw process, the method comprising:

a) delivering a stream of glass (1a) having a viscosity in the range of about 10 Pa.s to about 1000 Pa.s (100 poises to 10,000 poises), said stream of glass (1a) falling downward and having a first and second face

(s1, s2), each face is free from making contact with any surface and thus possibly being destabilized mechanically;

b) treating said delivered stream of glass (1a) prior to destabilization by putting a first face (s2) into contact with a surface of a treatment device or mechanism (4a) suitable, temporarily, to support the weight of said glass and for accompanying the falling movement of said glass while increasing glass viscosity and maintaining at least a central strip of said second face (s1) free from any contact with any surface;

c) releasing said treated stream of glass (1a') from said treatment device or mechanism (4a), said treated stream of glass falling (1a') downward from said treatment device or mechanism with at least said second face (s1) being free from making contact with any surface;

d) using a device or mechanism (7, 8) for controlling the speed, width and thickness of the treated stream of glass (1a) to act on the treated stream (1a') at a suitable distance downstream of the treatment device or mechanism; and

e) cooling said treated and acted on stream of glass to produce a sheet of glass.

The Applicant respectfully submits that Danner and Anderson do not teach or suggest a fusion down draw process that acts on the stream of glass or uses a device or mechanism (7, 8) to control the speed, width and thickness of the treated stream of glass (1a) to act on the treated stream (1a') at a suitable distance downstream of the treatment device or mechanism" as recited in claim 1 as previously amended. On page 3 lines 7-8, Danner (as indicted by the Examiner) merely teaches the sheet as "passing between a pair of rollers 23 which **may act on the sheet to either support or feed the same.**" (Emphasis added) It is respectfully submitted that "supporting" and "feeding" in this context controls none of the speed, width and thickness of the treated stream, but merely controls the stability and direction of travel of the glass sheet (supports and feeds). As such, there is no teaching or suggestion in Danner of a device or mechanism for controlling each of the speed, width and thickness of the treated stream of glass" as is presently claimed in claim 1.

It is further submitted that it is impossible to act on the stream of glass in a manner that controls the speed, width and thickness of the stream of glass downstream of the treatment device taught by Danner. As pointed out by the Examiner ("wherein one side of said sheet (F1) presents a "hardened skin surface which will prevent it becoming marred") one face of the stream of glass in the Danner device is cooled and substantially hardened by an air blast nozzle that presses the stream of glass against the impression roll 10. (See Danner Page 2, lines 82-96):

"The air-blast against the soft sheet not only serves to effectually press the sheet against the roll....., but also tends to quickly cool the outer side of the sheet and give it a glazed formation so that it will not be marred by coming in contact with a deflecting agent..."; "...the outer chilled or substantially hardened portion of the sheet.". (Emphasis added)

It is submitted that glazing to the point of protecting the surface from being marred would harden the surface of the glass and increase its viscosity past the working point, such that the glass could no longer be imprinted by the impression role, nor worked on downstream of the impression role to widen or thin the glass as currently claimed in claim 1. Attempting to act on such a hardened glass sheet/stream to change or control its width and thickness downstream of the impression roll taught by Danner would unacceptably fracture the substantially hardened or glazed surface of the sheet/stream of glass and/or cause the glass to warp due the uneven stresses created in the still soft surface relative to the opposing hardened surface of the stream of glass. Since the fused stream of glass taught by Danner cannot be further treated as is presently claimed, the process taught by Danner is not a "fusion draw" process as presently claimed in claim 1. As such, it is respectfully repeated that Danner teaches away from the fusion draw process presently claimed in all of the presently pending claims.

Anderson immediately lays a slot drawn (not fusion drawn) ribbon of glass onto the mold cavity 70, 74. Anderson does suction the glass into the mold cavities, but there is no thinning, or widening treatment of the glass ribbon taught or suggested by

Danner downstream from the mold cavity. Even if Anderson did teach such a downstream treatment of the sheet of glass, it would be improper to combine such a teaching by Anderson with Danner to arrive at the presently claimed invention, because, as previously described, Danner teaches away from such a step by teaching that one surface of the sheet is glazed or substantially hardened during the treatment step.

Claim 1 as previously amended also claims a process that delivers a stream of glass having a viscosity of about 10 Pa.s to about 1000 Pa.s (100 poises to 10,000 poises) to the treatment device. It is respectfully submitted that Danner as combined with Anderson, or any other prior art of record, fails to teach or suggest claim 1 as presently amended.

On page 7 of the Final Action, it is argued that:

“It is well established that in the art of processing (Kingery, pg 759) that for a typical soda-lime-silica glass....in the working range the viscosity is higher, being 10^4 to 10^8 P. Since the treated sheet of glass (1a') is substantially but not completely hardened, **the Danner process is understood in the context of the Kingery disclosure to produce a treated stream accepted to exist in the “working range”... Of a viscosity of about 10^4 to 10^8 P** which reads on the claim of a viscosity of about 10^4 to 10^8 P.” (Emphasis added)

First, the Applicant respectfully points out that that claimed viscosity of the glass upon delivery to the treatment device is from about 10^2 to 10^4 poises, which is outside the range of about 10^4 to 10^8 P alleged by the Examiner to be taught by Danner.

Second, the Examiner states that since **the treated sheet of glass (1a') is substantially but not completely hardened, the Danner process is understood in the context of the Kingery disclosure to produce a treated stream accepted to exist in the “working range”... of a viscosity of about 10^4 to 10^8 P**. To the contrary, the Applicant submits that the glass viscosity is already in the working range of about 10^4 to 10^8 P, not in the claimed range of 10^2 to 10^4 poises, prior to delivery to the

impression roll. See Danner page 1, lines 19-23: the sheet “while in a soft or **formative stage** as evidenced by the fact that glass has contact at one side thereof with the figure surface of a roll.” (Emphasis added) It is clear from this passage that the glass is already in the working range of 10^4 to 10^8 , e.g. in the “formative stage,” when delivered to the impression roll. The glass sheet must be in the working range of viscosity when delivered to the impression roll taught by Danner, so that that glass sheet can retain the configuration imparted to it by the impression roll. Also See Danner:

page 1 lines 27-27 “to impart the desired figure formation to the sheet”; page 1 lines 32-35 “to perfectly shape itself to the roll configuration so that such configuration is sharply and clearly defined”; page 1 lines 64-65 “the softer side will easily take the impression of the mold”; page 2 lines 63-66 “the roll 10 is provided on its periphery with any configuration or impression which it may be desire to impart to the side of the sheet”; page 2 lines 100-103 “In order to provide a surface of the sheet with well cut, clearly defined figures”; page 3 lines 27-30 “while the softer side will more readily take the impression of the roll”; and page 3 lines 70, 78, 87, 96, 103, 110, and 121; page 4 lines 1, 4-5, 17-18, 20, 35, 44-45, 50, 57-58, 67, 74, 82, 91-91, 104, 118, and 128; and page 5 lines 8-9, 18-19, 30-31 and 41.

On page 8 of the Final Rejection, the Examiner states that Danner fails to explicitly indicate a preferred viscosity of the stream of glass as delivered to the process. The Examiner goes on to state that (1) “Anderson presents a process wherein sheets of glass are delivered to a substrate with the goals of first conforming said sheets to a mold surface, (2) “Anderson indicates that the viscosity of the molten glass ribbon at delivery is between about 1000 to 5000 poise;” and (3) “it would be obvious “to deliver the sheets of glass in the Danner process in the same viscosity range as taught by Anderson to achieve a high fidelity impression.” The Applicant respectfully traverses these points as follows.

As for assertion (1) above (“Anderson presents a process wherein sheets of glass are delivered to a substrate with the goal of first conforming said sheets to a mold surface”), the Examiner appears to be arguing that Anderson teaches a process for

forming an imprint on the glass similar to Danner, and therefore it would have been obvious to one of skill in the art to combine Anderson with Danner in order to improve the Danner's analogous process of imprinting a glass sheet. It is respectfully submitted that Anderson does not teach a process for forming configure glass, which in the context of Danner means a glass sheet with a texture or pattern formed on or in one surface of the glass sheet. Anderson teaches a process of forming a glass sheet into a "multiwell plate for use in biological or chemical laboratory applications." See Abstract of Anderson and see Fig. 2. A quick glance at Figure 2 clearly shows that during the Anderson process, the entire glass sheet is sucked into the cavities 30 in the mold to form the glass sheet into a plurality of little bowl shapes or wells 34.

Albeit, Anderson admittedly teaches a process for conforming the glass sheet to the mold as alleged by the Examiner, this is much, much more than imprinting one side of a sheet of glass with a configuration as taught by Danner or achieving a high fidelity impression in one surface of a sheet of glass as apparently alleged by the Examiner. Where Danner hardens one surface of the sheet of glass to stabilize it and help prevent it from being marred, Anderson sucks the entire sheet, first and second surfaces, into the mold cavity, deforming both surfaces of the glass sheet to form a plurality of bowls or wells in the sheet. It is submitted that one of skill in the art would not have looked to Anderson, which teaches a process for making a plurality little bowls in a sheet of glass such that neither surface of the sheet remains flat, when seeking to improve or find solutions to issues they may be having when forming a flat glass sheet that has an impression on one surface thereof and a flat opposing surface as taught by Danner. To do so would be a combination of non-analogous art arrived at through the impermissible use of hindsight. For the same reasons, one of skill in the art would not have looked to Anderson in striving to make a glass sheet with at least one of said faces (F₁) presenting a high surface quality as presently claimed in this application. Anderson destroys the flatness of both sides of the sheet of glass, which is contrary to the teachings of Danner and to the presently claimed invention.

As for (2) above ("Anderson indicates that the viscosity of the molten glass ribbon at delivery is between about 1000 to 5000 poise"), and that it would have been obvious to use glass with this viscosity in the Danner process. This position is contrary

to the Examiner's position on page on page 7 of the Final Action, where the Examiner stated that:

“the Danner process is understood in the context of the Kingery disclosure to produce a treated stream accepted to exist in the “working range. **Therefore, the Danner process produces a treated stream (1a') at the end of the treatment presenting a viscosity in the range of about 10^4 to 10^8 .**” (Emphasis added)

As previously stated, the Applicant agrees with the Examiner assertion on page 7 of the Office Action, e.g. the glass in Danner is delivered to the impression roll with a viscosity in the working range, so that the glass sheet is capably of receiving and maintaining the imprinted configuration from the impression roll. If the glass sheet were introduced to the impression roll with a viscosity between about 1000 to 5000 poise, it is submitted that the sheet would not effectively hold the configuration impressed into the glass by the impression roll.

Although the invention as presently claimed no longer claims putting a first face (s2) into contact with a substantially smooth surface of a treatment device or mechanism, the Examiner continues to state that “in the absence of any evidence to the contrary, it is the Examiner's position that the prior art device [Danner] reads equally well upon treatment devices which are substantially textured or as well devices which are substantially smooth.” The Applicant repeats that this interpretation of Danner flies in that face of the teachings of Danner.

In order to preserve the right to claim a smooth treatment device in potential future claims, the Applicant again draws the Examiners attention at least to the following portions of Danner:

page 1 lines 27-27 “to impart the desired figure formation to the sheet”; page 1 lines 32-35 “to perfectly shape itself to the roll configuration so that such configuration is sharply and clearly defined”; page 1 lines 64-65 “the softer side will easily take the impression of the mold”; page 2 lines 63-66 “the roll 10 is provided on its periphery with any configuration or impression which it may be desire to impart to the side of the sheet”; page 2 lines 100-103 “In order to

provide a surface of the sheet with well cut, clearly defined figures”; page 3 lines 27-30 “while the softer side will more readily take the impression of the roll”; and page 3 lines 70, 78, 87, 96, 103, 110, and 121; page 4 lines 1, 4-5, 17-18, 20, 35, 44-45, 50, 57-58, 67, 74, 82, 91-91, 104, 118, and 128; and page 5 lines 8-9, 18-19, 30-31 and 41.)

From these and other portions of Danner, Danner clearly is not directed to a treatment device or mechanism that has a substantially smooth surface for producing glass with a smooth surface. Danner is clearly directed to a method and apparatus for forming figured (e.g. non-smooth, textured) glassware, wherein a glass sheet b is pressed against and takes the impression of the non-smooth configured surface of an impression roll 10, in order to impress a desired configuration into the surface of the glass sheet. Thus, the present invention's treatment device or mechanism (4a) which has a substantially smooth surface is not the same as Danner's impression roll 10 which does not have a smooth surface but instead has an impression/configuration which is imparted to the glass sheet b. Accordingly, Applicant respectfully submits that Danner does not disclose the invention of independent Claim 1 and its associated dependent Claims.

The Applicant particularly draws the Examiner's attention to Danner page 1 lines 43-47, which state “the sheet of glass flowing from the slab of directing member is **preferably at a higher temperature when making configure glass than when making plain sheet glass.**” The Danner reference is clearly making a distinction here between “plain sheet glass” that has two smooth surfaces and “configured glass” that, in Danner's words on page 2 lines 100-104 or page 1 lines 34-35, has “a surface of the sheet with well cut, clearly defined figures.” There is no doubt that when Danner refers to “configured glass” or to a “configuration” or “impression” on the impression roll or in the treated glass, Danner means that the surface of the impression roll and the surface of the treated glass each have a non-planer, non-flat pattern therein. The Applicant further draws the Examiner's attention to Figure 2 of Danner, in which the surface of the impression roll is shown with a cross-hatched, configured surface, not a smooth surface. Looking at the cross-section line in Figure 1 of Danner, it can be seen that the

roller is not shown in cross-section in Figure 2. Since the impression roll is not illustrated in cross-section in figure 2, then the cross-hatching on the impression roll in Figure 2 is clearly being used to indicate a non-smooth surface.

In view of the preceding arguments, it is submitted that claim 1 as previously amended, and therefore all of the pending claims (all of which depend from claim 1) are patentable over Danner as combined with Anderson under 35 USC 103, and that this rejection should be withdrawn.

Based upon the above remarks, and papers of records, applicant believes the pending claims of the above-captioned application are in allowable form and patentable over the prior art of record. Applicant respectfully requests that a timely Notice of Allowance be issued in this case.

Applicant believes that no extension of time is necessary to make this Reply timely. Should applicant be in error, applicant respectfully requests that the Office grant such time extension pursuant to 37 C.F.R. § 1.136(a) as necessary to make this Reply timely, and hereby authorizes the Office to charge any necessary fee or surcharge with respect to said time extension to the deposit account of the undersigned firm of attorneys, Deposit Account 03-3325.

Appl No.: 10/696,054
Response dated: July 24, 2008
Office Action dated: May 20, 2008

Please direct any questions or comments to Bruce P Watson at 607-974-3378.

DATE:

July 24, 2008

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Regards,

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